DEPARTMENT OF NATURAL RESOURCES

DIVISION OF FORESTRY

FOREST LAND USE PLAN/FINAL DECISION

for the

POTHOLE TIMBER BLOCK

COASTAL REGION
Kenai-Kodiak Area

November 2006

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Alaska Department of
NATURAL
RESOURCES

Forest Land Use Plan

I. INTRODUCTION

A. Purpose:

The purpose of this Forest Land Use Plan (FLUP) is to provide sufficient information to reviewers to insure that the best interest of the state will be served by the Department of Natural Resources, Division of Forestry (DOF), Kenai-Kodiak Area, offering for sale a maximum of 1,024 acres in a variety of timber sale offerings. The division will offer sales on both a competitive and negotiated basis, as determined by the Area Forester. The Pothole Timber Block contains an estimated gross volume of 10,240 thousand board feet (MBF) of spruce. Any sales sold we be offered at fair market value. The sales will support the small local timber industry by salvaging spruce trees that are dead, infested, or at high risk of infestation by spruce beetles, *Dendroctonous rufipennis* (Kirby); by providing sufficient quantities of green spruce to allow harvests to be commercially viable, and decrease potential of catastrophic fire by reducing fuel loading from dead trees. On the average, spruce beetles have killed or infested 20 to 80% of the mature spruce trees within the timber block. Leaving reserves of advanced regeneration and encouraging natural regeneration will help preserve the natural genetic diversity in Kenai forests. This proposal is designed to minimize impacts on visual quality, recreation, tourism, water quality, wildlife resources, and fisheries.

The Pothole Timber Block is composed of small "islands" of timber surrounded by muskegs. A decision will be made at a later date on how these "islands" will be grouped or divided into sale offerings. The silvicultural prescription selected for spruce in this block of timber is overstory removal with reserves. All merchantable timber over 11 inches diameter at breast height (DBH) will be removed, whether live or dead, while retaining approximately 3-4 large dead trees per acre for wildlife habitat and course woody debris (CWD). Pockets of advanced regeneration and pole sized trees will be retained and protected during harvest. The timber block has been used as a personal use houselog area for the past three decades. Most of the trees that would yield good houselogs have been removed.

The public and state agencies were invited to comment on any aspect of this proposed offering of timber within the Pothole Timber Block with regards to the AS 38.05.035 decision. This document was noticed in the Online Public Notice System. The notice also appeared in the Homer News and the Anchorage Daily News on August 31, 2006.

This final forest land use plan has been rewritten to include agency comments received.

B. Alaska Coastal Management Program (ACMP) Consistency: The Preliminary Decision/Forest Land Use Plan was distributed to State agencies and review participants notifying them of this proposed action on August 31, 2006. This document was noticed in the Online Public Notice System, Anchorage Daily News, and Homer News.

This action has been found consistent with the Alaska Coastal Management Program and the Kenai Peninsula Borough Coastal Management Plan and a Final Consistency Determination was issued on October 19, 2006.

C. Five Year Schedule: Most of the land contained within the Pothole Timber Block has been listed in the last edition of the Five Year Timber Sale Schedule for the Kenai-Kodiak Area as the Pothole Timber Sale (SC-3177K). However, there are potential sale areas within Sections 26, 35, and 36, Township 5 South, Range 15 West, S.M. that were not included in the last Schedule. AS 38.05.113(c) does allow for sales less than 160 acres in size to be exempt from the requirement of being included in the five-year sale schedule. We will include the additional area in the next five-year schedule, due to be completed in late 2006.

D. Location: The legal description of this proposed action is as follows: portions of Sections 25, 26, 35 and 36, Township 5 South, Range 15 West, S.M.; portions of Sections 30 and 31, Township 5 South, Range 14 West, S.M.; and portions of Sections 5 and 6, Township 6 South, Range 14 West, S.M. Anchor Point is the nearest community, and is located about 4 1/2 miles northwest of the timber block. Private and Kenai Peninsula Borough (KPB) lands are adjacent to the timber block. The timber block can be located on the United States Geological Survey 1:63360 Quadrangle map titled Seldovia C-5.

E. Title, Classification and Other Active or Pending Interests: The State received title to the lands proposed in this action under the following general grant patents: 6, 1227030 dated 5/23/62, 1217412 dated 2/27/61, & 1217604 dated 3/6/61; 1198, 1235445 dated 3/11/64 & 1232380 dated 6/21/63; and 107, 1232404 dated 6/25/63 and 1235379 dated 3/6/64. Section 36, T5S, R 15 W, S.M. was patented to the State as School Trust Land under patent #1226103 dated 4/2/62. The block is located in an area covered by the Kenai Area Plan (KAP - adopted January 2000) and has the following unit number and designation:

KAP Unit #237 Designated Resource Management – High Value

There is a municipal selection (ADL 227977) within Section 30, T5S, R14W, S.M. (The borough has given a non-objection to this proposal by email dated September 29, 2006.) The other active interest in the proposed timber block is a shallow natural gas lease under ADL 389256 issued 6/1/03; however, it was closed on 6/1/06.

Unit #237 also suggests that cultural sites are present in the unit. The Office of History and Archaeology has reviewed the proposed block in the Five Year Schedule of Timber Sales and indicated that the potential cultural sites are not within the proposed block.

These are the active and pending interests shown on the most recent status plats as of August 4, 2006.

F. Objectives:

1. The primary objectives of this block of timber for sale(s) are to provide jobs from logging and wood processing, reduce the wildfire risk and potential loss to adjacent resources, and salvage timber affected by bark beetles. Any sale will follow the constitutional mandate of sustained yield and adhere to the principal of multiple use. DNR may, in its sole discretion, decide to break this block of timber into small sales to meet local operator's needs and offer them on both a negotiated and competitive basis.

2. To follow DNR's constitutional mandate to encourage the development of the state's renewable resources, making these resources available for maximum use consistent with the public interest. Additionally, this proposal helps meet the Division's statutory responsibility to provide "…sound forest practices necessary to ensure the continuous growing and harvesting of commercial forest species on …state land."

3. The sale of timber within this block will enhance the State's economy by providing royalties to the state in the form of stumpage receipts and an infusion of money into the region's economy through direct wages, purchases of supplies, parts, and equipment.

II. LEGAL AUTHORITY

The department is taking this action under the authority of AS 38.05.035(e) (Best Interest Finding); AS 38.05.110-120; 11 AAC 71 (timber sale statutes and regulations); AS 41.17.010-.950 and 11 AAC 95 (Forest Resources and Practices statutes and regulations); and AS 46.40 and 6 AAC 80 (Alaska Coastal Management statutes and regulations).

III. ADMINISTRATIVE RECORD

The division will maintain an administrative record regarding the decision to offer timber within the Pothole Timber Block. This record will be maintained at the Kenai-Kodiak Area Office.

IV. DISCUSSION OF ISSUES

A. BACKGROUND

Physical Features

The Pothole timber block is situated within a geographical area that is characterized by level to gently rolling terrain. Slopes within the proposed harvest area range from 0% to 15%. The elevation is approximately 300 feet above sea level

and has a southwest aspect. The block is located in an area where the spruce beetle has killed many of the surrounding spruce trees and there is evidence that the infestation is still active.

The Natural Resource Conservation Service Soil Survey indicates there is one primary soil type within the potential harvest units of the timber block: Redoubt silt loam. This is a well-drained silt loam that lists susceptibility to erosion as moderate. Depth to water table is over 60 inches. The Redoubt series is one of the more productive soils on the Kenai. The adjacent muskeg areas are dominated by Starichkof and Doroshin soils, which are very poorly drained soils – water table at approximately 2-4 inches. There are also some small inclusions of Chunilna mucky silt loam, which are also very poorly drained with the water table at approximately nine inches. Chunilna mucky silt loam will grow spruce at about half the productive rate of Redoubt silt loam.

Waterbodies

There are scattered small, "pothole" lakes within the general area. The upper headwaters of Troublesome Creek reach into the northeast corner of Section 26 and the northwest corner of Section 25. Troublesome Creek is not known to contain high value resident or anadromous fish. The nearest anadromous and high value resident fish water body is the Anchor River (Anadromous Stream Catalog Number 244-10-10010) located about ¾ of a mile to the northeast of the timber block boundary. (See Issue F, Effects on Fisheries.)

There are no anticipated impacts to fish habitat or water quality.

Spruce beetle outbreaks can have an effect on water yields from impacted watersheds. Water yields are probably similar to changes that occur after logging with some minor differences caused by the standing dead trees and the length of time it takes to regenerate. There have been no hydrologic studies in Alaska quantifying or describing impacts associated with spruce beetle infestations. However, there have been studies conducted in other locations. In the Rocky Mountains, stream flow increased up to 22% annually for a watershed in the Colorado White River spruce beetle outbreak. Another study involving Mountain Pine Beetle in Idaho showed a 15% increase in water yield and a 2-3 week advance in snow-melt, and a 10-15% increase in low flows (USDA 1997). These are similar to studies involving timber harvest areas. However, in Colorado, the water yields continued for many years following the beetle outbreak in untreated watersheds. In harvested watersheds where young, vigorous seedlings were established quickly, the stream flows reverted back to pre-epidemic levels more quickly than untreated watersheds.

Stand Conditions

The forests within the proposed timber block are classified as closed Sitka spruce (*Picea sitchensis*) forest (I.A.1.a) (Viereck, et al 1992). Due to the extensive spruce beetle-caused mortality in some stands, the spruce needles have dropped off the trees and stem breakage is occurring resulting in opening up the stands. Forest stands within the area are predominately upland stands of approximately 95 to 100% spruce and 0 to5% paper birch (*Betula papyrifera*). On the Kenai Peninsula, there are natural hybrids between white spruce and Sitka spruce (*Picea glauca X sitchensis*). This hybrid is called Lutz spruce (*Picea X lutzii* Little). Researchers believe that this hybridization (a hybrid swarm) occurs at varying degrees with some trees showing strong white spruce characteristics, while others will show strong Sitka spruce characteristics. Stands within the proposed block show primarily Sitka spruce characteristics. These stands are relatively productive for the Kenai Peninsula with a site index of 65. Estimated growth at this site index is approximately 10 cubic feet per acre per year. Basal area of spruce, prior to the infestation, ranges from 120-300 square feet per acre. Average age of the overstory spruce is 200+ years, however some sites do have dominate trees of approximately 130 years. The average stand DBH is 12 inches, with an average height of 65 to 85 feet. Birch trees are few and widely scattered. The birch are old and in poor vigor. They are disappearing out of the stand. Advanced regeneration in the form of spruce seedlings are spotty; ranging from zero to 300 + per acre, depending on location and ground conditions. Birch regeneration is nearly non-existent.

Approximately 10 to 66% of all spruce 8 inches DBH and greater are dead from spruce beetles. Although the area came under attack by beetles in the late 90's, many larger spruce trees have lost significant amounts of bark and wood decay is advancing as evident by increasing wind-snap, soft borings and prevalence of *Fomitopsis pinicola*. Spruce beetles are presently active in the area and are infesting residual green trees. It is estimated that 2 to 10% of the presently green trees

are now infested (summer of 2006). There will be considerable changes to the living forest stand structure, including: reduction in average age of surviving trees, lower average DBH, lower average tree height, and decline in stand density. Residuals initially consist of suppressed and intermediate spruce resulting in decreased canopy cover (Schmid and Frye 1977). Natural spruce regeneration occurs when there is an adequate supply of viable seed and an appropriate seedbed (INFEST #9). Often what has occurred in unmanaged stands is a significant influx of grass and a lack of an appropriate seedbed for tree regeneration.

Light levels of bluejoint reedgrass (*Calamagrostis canadensis*) are present throughout the area and increasing in locations receiving additional sunlight from the loss of canopy cover. Grass competition with regeneration is expected to be high. Bluejoint reedgrass quickly establishes itself in stands killed by spruce beetle. Because this grass lowers the soil temperature and is such an aggressive competitor, it inhibits the regeneration of both tree seedlings and browse species (Lieffers, et al 1993). One study indicates that even after 11 years, no natural tree or browse regeneration had occurred (Holsten, et al 1995). Species diversity is declining in the forested stands and bluejoint reedgrass is becoming more dominant. Within two to four years following mortality, beetle killed trees begin to wind-snap and fall to the ground. The time-span between mortality and having the tree break-off and fall to the ground appears to be a function of the level of decay in the base of the tree at the time of mortality. Research has shown that 50 percent of the beetle killed trees break off and fall to the ground within 10 years (Holsten, et al 1995). These downed trees fall across each other or jackstraw and limit access and mobility of both human and wildlife use of the area (Thomas 1979).

Understory species included rusty menziesia, twisted stalk, equisetum, Beauverd spirea, Labrador tea, prickly rose, crowberry, star flower, wood fern, oak fern, feather mosses and club moss, to name a few. There are also some small pockets of devils club scattered through the area.

Wood decay fungi decompose roots, branches, and tree boles of dead trees and therefore play an important role in recycling wood in forests. However, sap rot decay also commonly and rapidly develops in spruce trees attacked by spruce beetles. Substantial amounts of potentially recoverable timber volume are lost annually due to heart and sap rot fungi on the Kenai Peninsula and is evident throughout the proposed timber block. Several species of sap rot fungi are associated with spruce beetle-caused mortality with *Fomitopsis pinicola* being the most common (USDA 1997). *Inonotus tomentosus*, a root disease, may also be present in the stand. Some of the stands near the coast also exhibit old snow breaks, which will affect volume recovery.

Changing Forest Fuels and Fire Suppression

The spruce beetle infestation during the 1990's resulted in the most significant ecological impact of any natural agent of change in Alaska (USDA 1996). The changes occurring in forests on the Kenai Peninsula are significant. Spruce beetles are greatly influencing the composition of forests by killing almost all spruce trees over 6 inches in diameter. In forest stands composed almost entirely of spruce trees, the effects to the forest structure caused by the bark beetle epidemic are evident. The almost total loss of mature seed bearing trees over large landscapes will have very long term and profound affects on the Kenai Peninsula.

Spruce beetle impacts begin with the attack of individual spruce trees. Although there is variation, typically, new emerging adult bark beetles infest host trees during the early summer season. The larva life cycle stage of the beetle destroys the inner bark or phloem of the tree that is vital for providing nutrients necessary for the tree's survival. By the second summer after bark beetle attack, spruce trees can no longer sustain life.

After bark beetle caused mortality, dead spruce trees begin a physiological change that occurs over time. The moisture content of the dead tree changes significantly. Foliage supported by moisture from root systems in live trees usually contains from 200 percent water content during the early summer to 120 percent during drought conditions. Tree boles of live trees usually range from 70% to 40% moisture content. This water content significantly decreases after tree mortality. Based on previous sampling of large dead tree material, it has been determined that dead spruce will reach equilibrium with environmental conditions within approximately 60 days following mortality. This material will typically have a moisture content of approximately 10%.

The loss of nutrient availability causes trees to shed needles during late winter and the remaining foliage turns red during the second summer after beetle attack. Smaller twig size branch material usually breaks off trees within a couple years after death. However, observation indicates this volume of fine size fuel material is often replaced with lichen material. *Bryoria fuscescens* (Old Man's Beard) favors dead spruce trees as a platform for lichen growth. Over time, additional branch material breaks off the tree.

As trees drop needle foliage and lose smaller branch material, an increase of direct sunlight reaches the forest floor. Surface vegetation changes with this event. Most noticeably, native blue joint reedgrass begins to dominate surface vegetation.

The boles of dead spruce trees are subject to natural decay processes such as "sap rot". The wood fiber structure changes so that tree boles loose elasticity and are not as flexible during windy conditions. A study of vegetative survey plots on the Kenai Peninsula (Holsten et. al. 1995) indicates that tree stem breakage begins to accelerate between 5-10 years after bark beetles attack forest stands.

As time progresses, standing trees begin to break off and fall into one another becoming jack-strawed. This provides a means for surface fires to accelerate the transition to crown fires in the remaining canopy. Over time trees begin to fall to the ground where they become part of the surface fuel matrix and as years progress the regenerating forests develop over heavy concentrations of fuels. The heavy concentration of fuel mixed with this regeneration will be available for combustion for many years. In some cases in the Yukon, it has been reported that the material will be readily combustible for 50 years after it has fallen to the ground (Beaver 1997). This period will likely be shorter on the Kenai Peninsula, especially when wood is in direct contact with the ground.

Downed trees create additional surface fuel loading, which combines with the heavy grass mat to create a serious wildfire hazard. As beetle killed stands unravel, grass cover increases from near zero to over 50 percent of the ground cover (Schulz 1995). Fires in this fuel type can be intense, rapidly moving, and difficult to control (See 1997). A 1994 study of a past beetle infestation showed a general tendency for increasing surface fuel loads in later stages of an infestation (Schulz 1995). This study showed an increase in woody surface fuel loading from approximately 9 tons per acre in 1987 to over 35 tons per acre in 1994; nearly a 400 percent increase. Another case study of fire in beetle-impacted forests was conducted in 1997 (Beaver 1997). An important product generated from this study is a comparison of fire "critical surface intensity" (CSI). CSI is the term used to describe the amount of surface fire heat production that is necessary to generate full crown fire involvement of tree canopies. In the case of spruce forests that are alive and unaffected by bark beetles, Beaver determined that 1,704 kilowatts/meter (KW/M) of surface heat intensity is required to ignite green trees whose crown begins an average of four feet above the ground. In dead beetle kill spruce with the same crown height ratio, only 192 KW/M is required to generate crown fires.

The moisture content in live trees is supported by root systems. By comparison, the moisture content of dead trees is subject to daily changes due to changing weather conditions and long term drying in drought periods. In an average year, it is estimated that environmental conditions necessary to allow for full crown fire involvement of live spruce forests only occurs about 2 to 3 days each year. The number of days where environmental conditions are reached that will allow for crown fire in dead trees occurs with much greater frequency. It is estimated that dead spruce forests can reach crown fire involvement about 30 days/year on the average.

The spread of fire is greatly enhanced in beetle-killed spruce. The amount of dead and dry fine material, such as Old Mans Beard lichen, that is contained in standing dead trees aids spot fire occurrence. Dead material down wind of a fire creates a condition where hot embers initiate new fire starts with much greater frequency when compared to green live forests (personal observation W. Wahrenbrock, DOF).

Another factor affecting the fire risk of forests is the probability of ignition. Probability of ignition is an expression of how easily a fire will ignite. Dead spruce with low moisture content will ignite far more readily than green spruce. Lightning has historically been an infrequent cause of fire ignition on the Kenai Peninsula (See 1998); however, wildland fire research scientists have declared the potential for lightning fire starts will increase as a result of the "sea of snags" that has been created (Alexander and Stocks 1997). The past couple of years we have experienced an increase in lightning caused fires, potentially associated with global climate change.

The probability of crown fire events is greatly enhanced as a result of the spruce beetle infestation. Once fires reach crown fire stage, they are difficult to suppress and are often uncontrollable. This fire risk condition will be sustained for about 10 years until such time as dead timber stands begin to break apart and unravel. The reduction of vertical fuel load continuity will not diminish the fire risk problem. To the contrary, increased fuel loading on the ground surface will extend the fire problem in fuel types that are known to be of short season duration. Specifically, grass that evolves with increased exposure to sunlight usually only creates fire control problems during the early summer season before "green-up". The addition of large woody material from downed beetle killed trees will create fuel conditions that will support fire occurrence throughout the summer season. These fuel types have been observed to burn with high intensity levels (M. Kromery, USFS, personal communication). Fires in this fuel type burn 20 times faster and 6 times more intensely than the fuel type associated with healthy white spruce stands, particularly in the spring and early fall (See 1997). Fires in downed spruce trees in grass fuels exhibit a high resistance to control by firefighters. This downed timber impedes access into a fire area by firefighters and will severely limit the use of tactical ground forces such as engines, dozers and hand crews (See 1998). Even when suppressing fires during moderate environmental conditions, placing crews in this type of fuel poses a significant personal safety risk should winds begin to rapidly increase, change direction, or if sudden slope changes are encountered.

Large wildland fires have occurred on the Kenai Peninsula at least since the beginning of recorded history. Large intense fires may become stand replacement fires because the burned areas regenerate with even aged trees that form young successional forests. The intensity of the spruce beetle attack has created a circumstance where spruce seed will not be readily available to regenerate burned areas. The advent of large landscapes of dead trees has also created a condition where fires will burn at high intensity but may not produce seedbeds that are receptive to forest regeneration. Several early season fires such as the Pot Hole Lake, Hidden Creek, and Crooked Creek fires, which resulted in suppression costs of $6.6 million dollars, demonstrate this problem. Even though the dead spruce canopy of these fires burned with high intensity, surface vegetation consumption was low due to high moisture content. Surveys of the Crooked Creek Fire revealed that the fire consumed only 2 to 3 centimeters (cm) of duff material and less than 2% of the surface area had exposed mineral soils (Berg 1996). To compound the problem of regenerating this area, virtually all birch, and the sapling size spruce that had not succumbed to the earlier bark beetle epidemic, were killed as a result of fire intensity. The lack of a seed source within and adjoining this burned area will compound the problem of reforesting this 17,000-acre area.

Had these large fires occurred closer to towns or improvements, structures could have been lost. The risk factors for a catastrophic wildland fire are starting to stack up on the Kenai Peninsula. With the right weather conditions, the scenario for a catastrophic urban-wildland interface fire with property loss and loss of life is a definite possibility. Studies in Alaska and Canada show that a large percentage of beetle-killed trees will fall to the ground in five to ten years. This downed fuel loading will add to the problem fire potential (See 1998). Of the three main factors affecting fire behavior (fuel, weather, and topography), fuel is the only component over which some measure of management may be exerted. Extensive fuel management is the only option for mitigating potential losses (Beaver 1997).

Wildlife

Large-scale infestations of spruce beetles have a significant influence on wildlife habitats by changing their structure and function (INFEST #11). The loss of the mature spruce and the potential loss of the younger spruce component will result in the loss of hiding and thermal cover (DF&G 1994). What birch is present often has defect indicators and declining rapidly within the stand. The remaining live forest component will be composed primarily of young spruce seedling/saplings and scattered birch. Grass, in locations where residual tree density is minimal, will become the predominant ground cover and will inhibit the development of suckering and sprouting plants which reduces the availability of browse (Holsten, et. al. 1995). Spruce regeneration is very poor on these sites as the grass quickly out-competes any seedlings that germinate. Without ground disturbance the heavy organic layer will continue to preclude desirable regeneration (see Issue E).

The spruce within the proposed timber block are approximately 10 to 40% dead, with increasing mortality occurring. When mortality of the stand is 80-100%, wildlife diversity may be expected to decrease (Stone 1995). Of the 92 bird species that may be expected to occur on the Kenai Peninsula, 37 will decrease in abundance (e.g. spruce grouse,

grosbeaks, Townsend's warblers) and 24 will increase in abundance (e.g. warblers and sparrows associated with shrubs). Eleven will have mixed or unknown response and 20 would not be expected to change in abundance (i.e. those not associated with forested habitats).

The ADF&G has observed 62 species of birds in the during field reviews on the Kenai Peninsula (DF&G 1998). Sixty-one percent are summer migrants and 39% are residents. Those nesting in spruce trees total 24% and 18% are cavity nesters. According to Wiedmer (DF&G 1998), most cavity nesters prefer mature aspens on the western Kenai Peninsula, but will use all tree species. Of the 62 species of birds observed in the general vicinity of this proposal, 8 species are listed as species of potential ecological concern or as State of Alaska species of special concern (West 1993a and ADF&G 1996 as quoted by DF&G 1998). Fourteen additional species are listed as rare species of the Chugach National Forest (West 1993b as quoted by DF&G 1998). Bald eagles frequent along the Anchor River to the north and east of the timber block, coincident with salmon spawning, but no nest sites have been identified immediately adjacent or within the proposed area.

Of the 39 mammal species expected to occur on the Kenai Peninsula, 13 may be expected to decrease in abundance following spruce beetle infestations (e.g., red squirrels, porcupines, flying squirrels) and 8 may increase (e.g., hares, voles). Eight will probably have mixed or unknown response and 10 would not be expected to change in abundance (i.e., those not associated with forested habitats) (INFEST #11). Brown bears may use the general area, although there is human development adjacent the area that probably discourages active use by bears. There are no spawning streams within the timber block, however, the Anchor River does have spawning salmon and is located about three-quarters of a mile to the north and east of the proposal at its nearest point. Black bears may also be present within the area.

Moose are found throughout the area. Moose population estimates for Game Management Unit 15, covering the western peninsula, are estimated at 6,000 to 7,000 moose (DF&G 2003). The moose population within Unit 15C (the southern half of the peninsula) has increased approximately 30% from 1993 to 2002 (McDonough 2004). DF&G observed that moose use the forested areas during the summer and feed heavily on the browse and forb species present. DF&G also observed that during the winter, moose pellet groups were less abundant in the interior of upland plateau timber stands than in riparian areas, on slopes and in or near glades. Willow, a primary browse species, is found more abundantly in open areas.

Furbearer populations on the Kenai Peninsula are stable or increasing. Wolf, coyote, beaver, mink, weasel, and river otter numbers are high. Wolverine and lynx numbers are stable, although lynx are in a cyclic low. Martin are rare to non-existent in Unit 15C (DF&G 2003).

Spruce grouse and red squirrels have declined in numbers, probably due to the spruce beetle infestation. Yeager and Riordan (1953) found red squirrels were less abundant in beetle-killed forests. Red Squirrels populations are closely tied to availability of conifer seeds and with the heavy mortality of cone producing spruce, the populations have become depressed.

Fish Habitat and Populations

The nearest anadromous and high value resident fish water body is the Anchor River. The Anchor River is located about 3/4 mile north and east of the timber block at its nearest point. The Anchor River provides spawning and rearing habitat for chinook and coho salmon, and Dolly Varden and Steelhead trout. It also provides habitat for resident rainbow trout.

DF&G has not observed any measurable effects on fish habitat directly attributable to the spruce bark beetle infestation. However, DF&G has not actively attempted to document any such effects or identify causative interrelationships for fish on the Kenai Peninsula. DF&G conducted a literature search of Alaskan and national computer databases and did not find any significant scientific literature relating to the impacts of bark beetle infestations on fish populations or their habitat (DF&G 8/1994).

It is assumed that infestation effects are probably similar to the general changes that occur after selective logging but with some differences caused by the standing trees. However, the degree of similarity of an infested area to a selectively harvested area depends on the geographic extent and intensity of the infestation (DF&G 1994).

Recreation

The area does not receive significant recreational use. There are no established motorized or non-motorized trails within the timber block, however, generalized use of ATV's was evident in the area. The area may be used for moose hunting in the fall, but there was no evidence of any established camps or recreational use sites.

This area is not known to have unique tourism values. At this time, there are no commercial recreation operations that use this area. There are no airplane access points within the proposed block(See Issue H).

Cultural:

The Office of History and Archaeology has reviewed the proposed area in the Five Year Schedule of Timber Sales and indicated that the potential cultural sites are not within the proposed block. No evidence of any cultural or historic features was found within the block by Forestry staff. During the course of activities associated with this timber block, cultural and/or paleontological resources may be inadvertently discovered. Should such discovery occur, the site shall be protected from any disturbance. The Office of History and Archaeology will be contacted immediately and state laws governing cultural resources will take effect.

Under the Alaska Historic Preservation Act (41.35.200), all burials on state land are protected. If burials or human remains are found, all land altering activities that would disturb the burial or remains shall cease and measures will be taken to protect it in place. The Office of History and Archaeology and a law enforcement officer will be notified immediately to ensure that proper procedures for dealing with human remains are followed.

Scenic:

Harvest areas will not be visible from the Old Sterling Highway. Timber harvest will be visible from aircraft, snowmobiles, and ATVs. Residents and visitors to Alaska consistently rated forest vistas damaged by spruce beetles lower in scenic beauty, and the more tree mortality present the lower the perceived scenic beauty. Both residents and visitors cite loss of scenic values as an important effect of beetle damage. Visitors consistently report sightseeing as a dominant activity, and indicate views seen as a major factor affecting the quality of their visit to Alaska. Respondents of a USFS study consistently preferred preventative thinning treatments to a no-treatment scenario. For forested areas already severely impacted by spruce beetle, respondents preferred the visual conditions produced by rehabilitation strategies that resulted in more rapid regeneration of forest cover. From a list of proposed actions including a no action alternative, respondents continued to prefer actions which would include cutting and removing dead trees, even if selling them would only recover part of the costs (Daniel et. al. 1991). Cutting and removing the dead trees was also chosen over the possibility of burning a site for forest regeneration. Similar results were obtained in other studies within the U.S. (Orland, 1997 and Orland et. al. 1993).

Land Use: Land uses were identified in Section I, E. Additionally, the area has been used as a personal use houselog area for the last three decades. These activities along with limited recreational use noted above are the primary uses of the area. No agricultural use or grazing is known to occur.

Transportation: The primary access to the timber block is off the Old Sterling Highway, turning onto Silverberry Avenue to Cranberry Road, and then left on Cloudberry Drive. Also, access to a portion of the block is off the Old Sterling Highway, turning onto Dusty Avenue. However, due to muskeg crossings, access to some of the potential units within the block would be restricted to winter only. Access across state lands developed to harvest any timber within this block will only be that access necessary to facilitate removal of timber. Roads will be constructed to minimize impacts and protect water and upland resources while achieving the forest management objectives. The amount of temporary road to be constructed will depend on what areas are eventually offered for sale. The temporary road will be a combination of winter road across frozen bogs and upland areas constructed of native material at a minimum standard. No permanent roads will be developed.

As determined by the DNR, the purchasers will be required to close roads on state lands at the conclusion of their sale. The temporary roads on state land that are put to bed upon completion of use will be closed in accordance with the Forest Resources and Practices Regulations on road closure (11 AAC 95.320). Additionally, wood debris will be spread over a portion of the road bed to discourage ATV use.

Where log hauling on ice roads is necessary, it will begin when underlying ground is frozen sufficiently to support equipment. This requires a minimum of 8 inches of snow and 6 inches of frost (Mihalow 1992).

B. SUSTAINED YIELD/ALLOWABLE CUT

This proposal complies with sustained yield/allowable cut principles outlined in the Kenai-Kodiak Area's Five Year Schedule of Timber Sales for CY-05 through CY-09.

C. HARVEST METHODS/SILVICULTURAL PRESCRIPTION

The silvicultural objective is to harvest dead, dying, and mature spruce, and to restore spruce cover while protecting water quality, maintaining recreational opportunities, and protecting sensitive wildlife.

The target stand at 120 years will consist of even-aged spruce with a multi-age spruce understory. Stand density goals will vary based on site productivity, but will range within 150-250 mature spruce and 40-80 pole-sapling size spruce. Basal area will be 180-260 square feet, and a spruce volume per acre of 12 to 16 MBF. Canopy openings of willow or bluejoint reedgrass should remain at less than 10% of the forested area. Muskegs will be unchanged. Insects and disease will exist at endemic levels.

The proposed timber block will consist of several sales that may be offered either on a negotiated or competitive basis. The silvicultural prescription selected for spruce in this block is overstory removal with reserves. All merchantable timber over 11 inches DBH will be removed, whether live or dead, while retaining approximately 3-4 large dead trees per acre for wildlife habitat and course woody debris (CWD). Pockets of advanced regeneration and pole sized trees will be retained and protected during harvest.

Summer logging opportunities exist on some areas if the purchaser(s) obtains access across adjacent private lands. Otherwise, sales within the block will be harvested in the winter. Logging will not be authorized during spring break-up, which usually occurs during a period from mid-April to June 1. The length of time to complete the harvest operations on individual sales will vary between one and two years. Directional falling may be required to protect 70 percent of the seedlings, saplings and pole-sized residuals. The contracts will require that care be taken to minimize damage to residuals.

Four to six tons per acre of debris (logging residue and natural debris) will be retained on site for nutrient cycling and wildlife needs. This material (limbs, twigs, and needles) is an important source of nutrients for the next stand of trees; typically over 95% of the nitrogen is contained within this material (Perry, et. al. 1989). Large amounts of nutrients such as phosphorous, nitrogen, and to a lesser extent for other mineral elements, are stored in the foliage, twigs, and branches; smaller amounts are in the main trunk of the tree (Bartels 1985). Delimbed tops will be re-scattered and allowed to decompose or will be burned. Some piles will be retained for their wildlife values. Disposal of green or infested spruce material larger than five inches in diameter shall be in accordance with the standards set in 11 AAC 95.195(b) of the Forest Practices Regulations. Stump heights will be kept as low as feasible, typically less than one foot.

The contract(s) length will be one to two years and timing restrictions, beyond that necessary to protect vegetation and soils during spring break-up, will not be implemented. Disturbance and displacement of wildlife will be only temporary, for a short period of time, and only affect the area of active operations, which is relatively small at any point in time.

Timber harvesting may be accomplished by using ground-based equipment such as feller-bunchers, rubber-tired skidders, forwarders, delimbers and on-site chippers.

D. REGENERATION

All sales will be harvested as described above. The residual pole, sapling-sized spruce, and advanced regeneration will contribute to the stand stocking following harvest. Birch is present in most stands; however it averages less than 5% of the total stem density. Birch is a prolific seeder, and despite concern for the age and low vigor of the birch, we do expect to see birch regeneration on site.

A careful review of stumps following harvest will be conducted to identify any pockets of *Inonotus tomentosus*, a root disease. Infected stumps and roots serve as inoculum sources for succeeding generations of spruce trees. In areas so infected, birch will be promoted over spruce because it is resistant to the disease.

Harvested areas will be scarified mechanically in preparation for natural regeneration where feasible. The preferred season is in late summer, prior to seed fall. No herbicides will be used. Scarification resulting in the exposure of approximately 25 percent of the mineral soil evenly distributed over the harvest unit will be completed on appropriate sites. The State will conduct regeneration surveys 4 years following harvest to determine if artificial regeneration will be necessary. The State will hand scalp and plant native spruce on the units that lack sufficient regeneration to meet stocking standards. Spruce seedlings will be grown from locally collected seed. This proposal may be adjusted post-harvest depending on the success in protecting residual seedlings and saplings.

Regeneration surveys will monitor trends of survival and species composition and also help to determine if any further reforestation effort is required to meet the reforestation requirements of the Forest Resources and Practices Act (11 AAC 95.375).

Estimated Costs:
Planting/hand scalp (if necessary): Purchasing seedlings, covering shipping costs, hand scalping and planting is estimated to cost approximately $1/seedling.

Scarification: $70/acre is the estimated average cost for the scarification of the summer harvest units.

E. EFFECTS ON WILDLIFE

The effects of the harvest activity will vary depending on species. Wildlife species that prefer mature and over-mature spruce stands will either be displaced or decline in numbers. Species preferring the grass-forb successional stage will likely increase in abundance (DF&G 1994).

Possible effects of the proposed timber harvest on several wildlife species are outlined below.

For black bear, the proposed timber block includes areas with potential late summer and early fall berry crops. It is doubtful that winter denning sites exist on the block due to its proximity to residential development. No denning sites were identified during field reviews.

Increased vulnerability of local black bear populations to hunting is a function of road location and road density which, in turn, is related to the timber harvesting systems used and the level of logging activity (DF&G 1994). The silvicultural prescription, as mentioned above, retains some cover adjacent to the muskegs for movement corridors. Access developed under any sale will be closed upon completion of sale activities and should help reduce impacts on bears.

The brown bear population on the Kenai is presently estimated to range between 250-300 bears (Schwartz, et al. 1999). The highest densities of brown bears are in the forested lowlands and sub-alpine areas west of the Kenai Mountains. There is presently no indication of a decreasing population (DF&G 2000). The population numbers were probably at an all-time low in the 1920's due to the tendency of locals to shoot most bears on sight (Shuster, USFS, personal communication 1997) and the population had been poisoned in the early part of this century (Jacobs 1989). Their distribution often overlaps that of black bears (DF&G 1994). They generally frequent remote, higher elevation, sub-alpine and alpine habitats more often than black bears (DF&G 1994). No denning sites were identified within the proposed timber block during the field reconnaissance. Additionally, the proposed does not occur within the elevation

range commonly chosen for den sites by brown bears (Jacobs 1989). Again, due to the proximity of the timber block to human development, the area is not expected to be utilized frequently by brown bears.

The spruce beetle infestation may reduce the value of the timber block over time for brown bear as hiding cover decreases and vegetation composition of the understory changes. Because of the relatively large home range and mobility of bears, the future degradation of the infested stands will probably not have significant impacts on the bear populations (USFS 1990 and DF&G 1994).

Increased access associated with resource development is of concern to wildlife managers (DF&G 2000). Roads associated with the timber harvest may cause behavioral changes with the bear population. Although evidence suggests that road avoidance behavior and habitat loss leads to changes in wildlife productivity and survivorship, there is little data currently available to support this hypothesis (Frederick 1991). To be of major concern to wildlife managers, behavioral responses to disturbance must have demonstrable demographic consequences. Demographic responses do not necessarily follow, even from significant behavioral responses to changes of the habitat (McLellan and Shackleton 1988). Significantly, the demographic response by brown bears on the Kenai Peninsula has been an increase in the population. Since the 1950's the brown bear population on the peninsula has increased to a current estimated population of 300 (Schwartz, DF&G 1997, personal communication). This is despite a human population increase on the Kenai Peninsula from 9,053 in 1960 to 48,815 in 1998.

Several researchers suggest that grizzly bears habituate to open roads by shifting to a more nocturnal activity pattern. Apparently, darkness may serve as cover, allowing bears to use roads and adjacent habitats and cross open areas where they are vulnerable to human harassment and hunting mortality. To use areas within 100 meters (approximately 328 feet) of roads within their home range, bears have often done so under the cover of darkness by being nocturnal in their travel and feeding patterns (Frederick 1991). This travel period may be shorter in Alaska due to the state's latitude. However, numerous studies, including at least one in Alaska (Olson, et al 1998) have shown that brown bears will use highly disturbed areas by being nocturnal, while bears in undisturbed areas tend to be more crepuscular (active during twilight)(Frederick 1991). Some studies have shown that bears within cover and some yearlings did not change position when vehicles approached. It has also been noted that sows with cubs and yearling juveniles more frequently used habitats near roads than other bears. These areas may have been relatively secure because potentially aggressive adult males avoided them (McLellan and Shackelton 1988). Several researchers reported that adult bears in open sites usually retreated to cover when a vehicle approached within 300 meters (984 feet). However, researchers McLellan and Shackleton found that bears fled even further when approached by people on foot; in 5 of 9 cases when bears in remote areas were approached by humans, bears fled for distances greater than 1 km (0.6 miles), or out of the immediate drainage (Frederick 1991). This illustrates that bears find vehicular traffic less threatening than people on foot. This may be attributable to habituation.

To maintain and potentially increase the brown bear population on the Kenai Peninsula, DF&G continues to adjust hunting seasons for brown bears. An estimate of the total bear population and reproductive rates is used to determine the annual harvest. Bear population goals have been met in recent years by a spring bear hunt and Defense of Life and Property (DLP) takings. Fall hunts are often suspended due to DLP's. In 1998 DF&G placed the brown bear residing on the Kenai Peninsula on the State's "Species of Special Concern" list. DF&G made this administrative decision as a proactive measure to focus attention and research efforts on the peninsula brown bears (DF&G 2000).

Wildlife biologists have expressed concern about the increasing trend in brown bear mortality caused by DLP takings and potential for additional mortality from human encroachment into bear habitat. The number of non-hunting kills, which includes DLP, research mortalities, and other known human-caused mortalities, increased each year from three in 1991 to ten in 1995 and fell back to six in 1998 and 7 in 2000. Since 1986, approximately a third of the DLP's are occurring near homes, another third is associated with hunting, and the last third is from various activities such as fishing, hiking, ranching, etc**.** None of the DLP's were directly associated with timber harvest operations (Ted Spraker, DF&G, personal communications 1998 & Gino Del Frate, DF&G, personal communication 1997).

Kenai Peninsula bears killed in defense of life and property are more likely to occur close to roads and trails (IBBST, 2001). Motorized access will be developed under this proposal, but roads will be kept to the minimum necessary for this management activity and then closed. Harvest operations are not expected to exceed two years, so disturbance from

harvest operations will be relatively brief. Temporary roads will be water-barred, cut and fill slopes stabilized, culverts removed, and woody debris spread over a portion of the roadbed and left for reestablishment of vegetation. Grass and alder will reseed rapidly on disturbed sites and help in effectively closing the road access. These actions are intended to closely align with the recommendations of the Kenai Peninsula Brown Bear Conservation Strategy (DF&G 2000).

The primary impact of harvesting may be on the home range of resident bears. However, research suggests that home ranges for brown bears can cover tens to hundreds of square miles and because of this variability, the concept of home range size is not very useful (DF&G 2000). Use of salmon spawning streams are clearly important for brown bears during the summer and fall, however, only the Anchor River to the east of the timber block has spawning salmon. Again, the Anchor River is at least three-quarters of a mile to the north and east of the timber block and any harvest will have little impact on the use of the river by bears.

In the fall, bears travel great distances to feed on devils club berries in the mountainous portion of the peninsula (Collins, DF&G 1998, personal communication). Berries, where present, are also an important summer and fall food item for brown bears (Suring 1998). There are some small devils club patches within the timber block, but they are infrequent. In the spring, bears' diets often consist of skunk cabbage (*Lysichiton americanum*), grasses (*Calamagrostis spp*.) and horsetail (*Equisetum spp*.), which are widely distributed across the peninsula. Logging can benefit grizzly bear populations if production of berry producing shrubs is increased. Bears consume ungulate carrion and are effective predators on moose. Recent research has shown that spring and early summer range is important because brown bears are very efficient predators of moose calves (Charles C. Schwartz, DF&G, personal communication 1997). Generally, the areas of highest habitat value include areas with southern aspects and wet habitats within defined ungulate winter range (Suring 1998).

The availability of security cover is considered important in how brown bears are influenced by human activities. Brown bears are at least twice as likely to be displaced from open areas where they can see or be seen by humans (Suring 1998). Areas adjacent to the muskegs will have a no harvest retention buffer and an additional green tree retention buffer that will provide some cover. However, the harvested portion of the timber block will provide little cover for bears until the regeneration reaches an adequate height.

Within the boreal forest, moose are generally more closely associated with forest cover in summer than in winter. This may reflect a preference for forage that is higher quality as a result of delayed plant development or different plant characteristics. Cows may prefer to calve and bed their newborns on forested knolls or other vegetated high points from which predators are more easily detected. These features may also present varied escape routes that require minimal energy expenditure by calves (Collins 1995).

As the dead spruce fall to the ground, escape routes will diminish and it is likely that energy expenditure by newborn moose (neonates) for escape will be increased. The increase over time in the amount of deadfall that will occur without intervention will also decrease sight distance that may result in additional predation of neonates. The increasing amount of deadfall and debris on the forest floor could limit access to preferred foraging areas and limit mobility during critical times of the year for moose (DF&G 1994). DF&G (2003) notes that increasing deadfall over time will make moose travel through these areas more difficult. Wellner (1978) suggests that downed material from beetle infestations will prevent access to forage and browse by big game species and that the seriousness of the problem is associated with the quantity of trees killed per unit of land. Slash depths of 1 to 2.3 feet reduced forage production and hindered access for many wildlife species (Bartels 1985). Lyon & Jensen (1980) reported that deer and elk show an approximately 50% reduction in pellet groups in Montana forests where dead and down timber reached or exceeded 0.5 m (approximately 20") in depth. The problem with downed timber can persist for long periods of time. Downed timber of lodgepole pine can last from 20 to 40 years (Brown as quoted by Wellner, 1978).

While biologists recognize the importance of overstory disturbance in the boreal forest in terms of enhanced production of moose browse, recommendations for the size and shape of the forest openings vary greatly from 5 acres to a square mile or more. Generally, the most important reported relationship between size/shape of created openings and their utilization by moose is related to seeding distance and establishment of important species (Collins 1995). While birch is not a significant component of the existing stand, we have seen several similar areas on the southern peninsula where birch has contributed to the regeneration of the harvest sites and do contribute to browse production.

Cover is more important in summer conditions; moose have an efficient way of keeping warm in severe weather but are less efficient in moderating the effects of high summer temperatures that can cause them to overheat (INFEST #6). The buffers along the muskeg will provide some cover, but the harvested areas will not provide shading and calving areas. Islands of timber are being retained to provide cover.

Whole-tree skidding or skidding with the top attached to the last log will reduce the amount of slash left in the harvest area. This will reduce the potential of physically hindering moose use of the area, and reduce energy output during winter travel.

It is anticipated that harvest operations will likely reduce available prey for ermine for an extended period of time. Unharvested areas, snag retention and muskeg leave areas will also offset some of the impact on ermine habitat.

Mink use of the area, both presently and post-harvest is expected to be low. Mink are commonly found near streams, ponds, marshes, beaches, or muskegs. The aquatic and riparian habitats are the most important mink habitat and proposed harvest within the block will provide for a leave retention area along the wetland areas adjacent to harvest areas.

River otters, like mink, prefer aquatic and streamside habitats. Timber will be retained along any streamside areas within the block.

Lynx occur throughout the general area. Lynx will use early successional habitats resulting from timber cutting, but require proximity to mature mixed forests (DF&G 1994).

As the spruce forest on the peninsula dies, red squirrel populations will decline as squirrels move to nearby lower quality, marginal habitats where food may be available (DF&G 1994). Cover habitat for squirrels also declines after the first two years as trees lose their needles. The absence of conifers makes the squirrels more susceptible to predation from raptors and larger mammals (USFS 1994). It takes at least 30-50 years after spruce has been reestablished before the area will provide quality red squirrel habitat (USFS 1994).

Similarly, the proposed prescription for harvest will reduce squirrel numbers, but populations will likely remain intact, though at lower densities than prior to timber harvest (DF&G 1994). Ground cover and security from raptors will likely increase with the reforestation practices that are being incorporated. By ensuring quick reforestation after harvest, quality habitat conditions for red squirrels should be achieved in a much shorter time than in the unmanaged beetle killed forest.

Spruce grouse are also affected by the loss of spruce trees to the spruce beetle primarily through the loss of winter feeding habitat (DF&G 1994). Gradual loss of escape and thermal cover habitat will also occur as the spruce trees lose their needles and eventually fall over (DF&G 1994). The decreased winter food supplies (loss of spruce needles and buds) may displace grouse into areas of lower quality habitat that could increase nutritional stress, and lead to increased mortality (DF&G 1994). Predators associated with grouse, such as owls and goshawks, can be expected to show a response to the increased vulnerability of individual birds displaced by the infestation (USFS 1994). In large-scale infestation areas increased amounts of deadfall, grass, and other debris will impede grouse reproductive displays and reduce summer feeding habitat (DF&G 1994). The end result of no treatment of these dying stands will be a decline in local spruce grouse populations (USFS 1994).

Harvest operations will have similar effects. The loss of canopy will result in increased mortality from predation because of more visible nests and loss of protection from inclement weather (DF&G 1994). Leave areas will help to offset this loss to the extent that they are useful. Scarification, where feasible, and quick reforestation efforts will help to create more suitable habitat conditions in a shorter period of time than if left in an unmanaged condition.

The spruce bark beetle infestation has increased the number of snags and downed woody material, likely benefiting cavity-nesting birds such as woodpeckers, some owls, brown creepers, nuthatches, and chickadees (DF&G 1994). Most snags are beetle-killed spruce. However, mature hardwood stands that contain some hardwood snags offer the most cavities. This is due to the morphological differences between spruce and hardwoods. Living spruce seldom has soft heartwood preferred by cavity nesters. Spruce that die usually falls to the ground within 10 years, which is the time it

takes for the heartwood to soften. The larger diameter birch, aspen, and cottonwood trees are more important than spruce for cavity nesters, however, there is very few birch within the timber block and no aspen or cottonwood trees. Spruce snags of 3-4 per acre will be retained for wildlife use. After the beetle outbreak subsides, woodpeckers will still benefit from the large numbers of secondary insects (*cerambycids*, ants, other *scolytids*) present, but this food abundance should only last 2 to 3 years (Schmid and Frye, 1977). The feeding value of these insects for woodpeckers will decrease because they are generally fewer in number and less accessible (they feed in deeper recesses in the wood). After these insects decline, the bird population is also expected to decline because of a lack of food. As the needles and bark fall off dead trees over time, these populations will also decline because of the reduction in available food and cover (DF&G, 1994).

The potential effects from a timber harvest on cavity-nesting and other non-game birds will be the shortage of suitable nesting trees, which could result in lower numbers of birds. The conversion of sites to early successional stages could result in a shift in bird species composition to favor birds that prefer grass, shrub/forb, and sapling habitats (DF&G 1994).

F. EFFECTS ON FISHERIES

The harvest of timber within the block should have no effect on fisheries. The nearest anadromous/high-value resident fish water body is the Anchor River, which is located approximately three-quarters of a mile to the north and east of the timber block. The only stream within the timber block is Troublesome Creek and no stream crossings will be developed. Because of the gently to moderately sloping terrain and soils that have a slight to moderate potential of erosion, harvest areas are not predicted to be a significant source of sediment.

G. EFFECTS ON SUBSISTENCE

The subject area has not been designated as a subsistence zone. Under current state law, subsistence harvest opportunities within the timber block have been incorporated in general hunting and fishing regulations (DF&G 10/23/94). There are the following possible subsistence uses in the area: trapping, hunting and gathering of berries. The effects of the spruce beetle infestation and the proposed timber harvest on wildlife species of interest to both trapping and hunting are detailed above in the two wildlife sections. Most of the *Vaccinium* species prefer open forest conditions, which would tend to indicate that the berry crops might do well as the stands open up. However, Holsten, et al. (1995) indicated that on untreated beetle killed sites, lowbush cranberry decreased in number and on burned sites it doubled. It is anticipated that the berry crop will not be significantly affected by the proposed treatment.

H. EFFECTS ON RECREATION

Presently, there appears to be little recreational use of the area. Any harvest is not anticipated to significantly disrupt historical uses.

I. EROSION

There are two soil erosion concerns - surface erosion and mass wasting of soil and debris. Surface erosion is primarily caused by road construction. Surface erosion will be minimized by strict adherence to the contract guidelines and Forest Resources and Practices Act standards. There are no stream crossings involved in the proposed harvest areas.

With regard to mass wasting and debris avalanches, such events normally occur on slopes over 62 percent (62%). There are no slopes of this magnitude in the timber block. The ground is level to moderately rolling and risk of both surface erosion and mass wasting from the harvest operations is negligible.

J. EFFECTS ON MINING

There is no known mining activity in this area and therefore no effect.

K. EFFECTS ON MATERIAL SOURCES

This proposed harvest will not preclude future development of a material site. Use of state-owned sand or gravel on projects other than this proposal requires authorization from the Division of Mining, Land and Water (DMLW). Excavation of materials requires a Reclamation Plan to be submitted to DMLW for approval.

L. ECONOMIC IMPACTS

The harvest of timber will have an effect on local employment by generating or maintaining an estimated 8-12 jobs directly associated with the harvest and regeneration actions. Timber harvesting is expected to benefit the local economy by providing much-needed jobs and forest products for local forest products industries. This action is not expected to adversely impact any of the other industries on the Kenai Peninsula. The Kenai Peninsula business community will receive direct economic benefits from providing support services to the operators through sales of fuel, food, housing, medical and miscellaneous supplies. The residents of the borough will receive an indirect benefit through taxes paid to cities and the borough by the operator(s) and employees during the course of the timber harvest operations. As explained above, there are no expected impacts on fisheries. This area is not used for commercial recreation or tourism. Timber sales will have no effect on oil and gas operations.

Economics of harvesting are affected by the ability to recover valuable forest products from the infested stands. Defects that reduce volume recovery include heart or conk rot, sap rot and weather checks. Heart rot is typically present prior to attack by beetles, where sap rot and weather checks are the most common forms of deterioration associated with beetle-killed trees (Lowell 1995). Typically, beetle-killed trees standing 3 to 5 years will have the largest amount of defect, thus affecting volume recovery. Green trees have significantly more volume recovery than do trees infested by beetle (Lowell 1995). A larger percentage of lumber in higher grades can be sawn from green trees over beetle infested or beetle-killed trees. In a recent study, 68% of the lumber recovery in green trees was in Standard No.1 and No.2 or better. Where trees were dead for 3 years or more, the lumber recovery in Standard No.1 and No.2 or better were only 34% (Lowell 1995). A Colorado study of beetle-killed Engelmann spruce showed a 39% decrease in value of dead logs compared to live logs (Cahill 1980). Rapid removal of beetle-killed trees is necessary to recover sufficient value to cover harvesting, processing, and where appropriate, regeneration costs.

Studies that examined pulpability of dead, dying and decayed trees, utilizing a kraft pulping process, showed that standing white spruce killed by spruce beetles still produced good pulp yields for as long as 50 years following mortality (Werner, et al 1983). However, a recent study by Scott, et al (1996), indicated that sap rot can lead to inferior pulp and lower pulp yields. As mentioned earlier, *F. pinicola* is evident throughout the stand and continues to cause decay. The presence of this sap rot will lower recovery of chipable material that can be used for pulp. Increasing costs to produce products and lower returns will affect marketability of the logs from this area.

Large amounts of potentially recoverable timber volume are lost annually due to heart and sap rot fungi on the Kenai Peninsula, where salvage logging has not kept pace with tree mortality from the continuing spruce beetle epidemic (Holsten and Burnside 1997). This has resulted in severe fuel loading, increased likelihood of a catastrophic wildland fire, lost opportunities of revenues and economy diversification for the Borough and State, along with lost opportunities for rapid reforestation.

M. MARKET CONDITIONS

At the present time, markets for dead material are spotty to non-existent. The local market includes domestic sawlogs, houselogs and firewood. Because material from this timber block is relatively recent dead or is still green, much of this material may be used in the local sawlog market. No one is currently exporting timber from the peninsula.

The economic conditions in the general vicinity of this proposal are fair. The current local economy is based on oil and gas industry, tourism, commercial and sport fishing, logging, retail, and government employment. The Kenai Peninsula Borough historically has had a high seasonal unemployment rate. Timber harvest within the area, which can be harvested in the winter, may provide employment opportunities during what has traditionally been the off-season.

Near the end of 2003, the market for chips from the Kenai Peninsula ended. The chipping company sold off their assets and the chip loading facility located on the Homer Spit was dismantled in early 2004. There are currently no large active

sales occurring on the Kenai. Numerous smaller sales of private timber have occurred in the past 7 to 8 years. Logs from these sales are being sold to several individually owned small sawmills in the area.

Sales offered under this proposal will be appraised based on market values of similar local timber sales. All sales sold will be offered at fair market value.

V. OPTIONS

After a review of the material and information discussed above, the following alternatives have been considered:

1. To continue offer timber sales within the block as outline in this FLUP.
2. To offer sales within the block at another time.
3. To not offer sales within the block.
4. To modify the harvest prescriptions to utilize more selective logging methods that leaves more trees standing (alternative silvicultural treatments).
5. To utilize prescribed fire to reduce fuel loading and reforestation of the timber block.

A discussion of the five alternatives follows:

1. We believe that this is the best alternative and meets the objectives outlined in Section 1, F, to meet constitutional and statutory objectives to develop a source of logs for the forest products industry, salvage beetle killed timber, accelerate regeneration, and reduce fuel loading on the landscape. The proposed action meets the silvicultural objectives of restoring the health of the forest and using the beetle killed spruce timber prior to further loss of market value. Smaller sales are more advantageous to local operators and we will break the timber block into smaller sales to be offered as both competitive and negotiated sales.

2. We believe that postponing the harvest of timber within the block is not in the public interest. Without these sales, timber operators will have no source of timber for local mills. Without a wood source, both timber operators and mill owners will go out of business, which would be a loss of jobs and revenue to the local economy. Additionally, the increasing fuel loading as a result of the dead trees is not in the public's interest. Trees that would otherwise be salvaged would become sources for ignition and fuel loading for a potential catastrophic wildland fire. This timber block is located in the wildland-urban interface and is a high priority for removal of potentially hazardous fuels. Decay in beetle killed and infested trees sets in rapidly, creating a loss in value and marketability. Additionally, postponing the sales to a later date could result in sufficient loss of market value that the sale would become uneconomical.

3. This alternative would result in not meeting any of the objectives outlined for this management action. Dead trees will become likely sources for ignitions and potential catastrophic wildfires on the landscape scale. Residential developments in the area could potentially be at risk of a wildfire. These fuels within the wildland-urban interface would not be removed and risk of wildfire would remain for an extended period of time. Utilization of the forest resource would not be achieved and there would be no contribution to the state and local economy. Opportunities for utilizing this area for recreational purposes would decrease as dead spruce jackstraws on the ground making travel difficult and unpleasant. Downed dead trees will also negatively impact wildlife, particularly moose.

4. Alternative Silvicultural Treatments: In the development of the proposed silvicultural treatment, alternatives were considered. The FLUP incorporates our recommended treatment. Thinning is an inappropriate treatment due to the level of mortality and the amount of incipient rot. This alternative would have been viable if the spruce beetle had not been at epidemic levels and if more live spruce trees were within the sale areas. Hard and Holsten in their (1985) publication, "Managing White and Lutz Spruce Stands in South-Central Alaska for Increased Resistance to Spruce Beetle", suggest partial cuts (thinnings) only in uninfested or lightly infested stands. Spruce beetle has significantly infested the stands within the timber block. In areas where the spruce beetle has not impacted the timber stands significantly, the beetle is actively infesting new trees. We believe the prescription recommended will result in economically viable salvage operations that will help to reduce the fuel loading in this critical area within the wildland-urban interface. Potential seed trees will be retained along the outer perimeter of the sale and the mechanical scarification, where feasible, will provide

greater opportunities for natural regeneration of the harvested area. Planting of spruce seedlings will be completed where necessary to bring stocking up to FRPA standards.

5. The use of prescribed fire should be designed to meet specific objectives of reducing fuel loading, protecting private developments, and promoting natural regeneration. These objectives would be difficult to achieve on the timber block. In order for a prescribed fire to successfully promote natural regeneration, the fire must burn hot enough to expose mineral soil. Mineral soil provides the most favorable sites for germination of tree seeds for natural regeneration. Recent fires on the peninsula have not resulted in significant exposure of mineral soil because of moisture in the organic layer that covers the mineral soil. A long drying trend is necessary to dry the organic layer out sufficiently to be consumed by the fire and result in exposure of mineral soil. On fires where the organic layer is not removed, grass rapidly invades the burn area and forms a dense mat, which precludes the germination of tree seeds. Tree seed must also be available to seed in on exposed sites. Younger spruce on site would mostly likely be consumed by the prescribed fire and would therefore not be able to contribute seed to the regeneration effort.

A prescribed fire would reduce fuels by consuming most of the small fuels, including needles, twigs, and branches. The boles of the beetle-killed trees would potentially be partially consumed by the fire. Over time, these tree boles will fall to the ground, creating again a substantial fuel load. This material would then provide fuel for a potential re-burn.

Recent efforts to conduct prescribed fires on the peninsula have demonstrated the difficulty of having the necessary resources available when environmental conditions are conducive to achieve the prescribed fire objectives. When the organic layer has dried sufficiently, the weather conditions are within prescription, and the smoke management considerations are met, wildfires are often burning under these conditions as well and resources are assigned to suppress the wildfires. This results in resources not available for conducting the prescribed burn. If resources are brought in from outside the immediate area, this increases the cost of conducting the prescribed burn and also reduces the availability of these resources to support on-going or new wildfire suppression efforts. Additionally, any escape of the prescribed burn would tap suppression resources that will already be heavily utilized and in short supply. Because of the close proximity of residential development to the timber block, conducting a successful prescribed fire would be very difficult.

For the above reasons, prescribed fire is not considered a viable management alternative.

VI. ACMP CONSISTENCY

This action has been found consistent with the Alaska Coastal Management Program and the Kenai Peninsula Borough Coastal Management Plan and a Final Consistency Determination was issued on October 19, 2006. A copy of this determination is part of the administrative record on file with the State.

VII. CONTENT ANALYSIS OF COMMENTS RECEIVED AND AGENCY RESPONSE

This document was noticed in the Online Public Notice System. The notice also appeared in the Homer News and the Anchorage Daily News on August 31, 2006.

We did not receive any public comments within the review period.

We received two comments from review agencies. The Division of Mining, Land and Water commented to emphasize that removal of sand or gravel from State-owned lands to be used on other projects would require a separate authorization along with a Reclamation Plan. Additionally, any areas impacted by excavation and extraction would require the filing of a Reclamation Plan.

The Kenai Peninsula Borough also commented on this proposal. The borough has selected a portion of the lands within the timber block, but had no objection to proceeding with plans to harvest and reforest the subject lands. (Lands subject to the borough selection are identified in Section I, E of this document.)

VIII. FINAL FINDING AND DECISION

The purpose of this decision is to determine if the Department of Natural Resources, Division of Forestry, shall make available timber located in the vicinity of Anchor Point in portions of the W1/2 NW1/4, SE1/4 NW1/4 Section 30, portions of the W1/2 NE1/4, S1/2, NW1/4 of Section 31, Township 5 South, Range 14 West, S.M.; portions of Sections 25, 26, NE1/4 NW1/4, N1/2 NE1/4, SE1/4 NE1/4 of Section 35, and Section 36, Township 5 South, Range 15 West, S.M.; and portions of S1/2 NW1/4, N1/2 SW1/4 of Section 5, and Section 6, Township 6 South, Range 14 West, S.M. The timber will be offered in a series of small sales by both competitive and negotiated means at the Division's discretion.

The offering of timber as proposed in this finding is in the best interest of the State for the following reasons:

1. The sales would meet the objectives outlined in this Forest Land Use Plan.

2. The sales would make wood available to the local timber industries.

3. The sales would allow for the salvage of beetle killed and infested trees, thereby reducing the potential for a catastrophic wildfire.

4. The impact of the sales on other uses, such as fish and wildlife habitat, has been carefully considered, mitigation actions initiated, and impacts are anticipated to be negligible.

5. The sales would provide for utilization of the Area's annual allowable cut and make for a more productive, vigorous and healthy forest.

6. Reforestation through a combination of mechanical scarification, natural seeding, and hand-scalping and planting will re-establish a healthy forest utilizing native spruce seedlings.

7. The sales have undergone agency and public review and concerns have been resolved in the preparation and design of the sales.

8. The sales have been determined to be consistent with the Kenai Peninsula Borough and the State of Alaska coastal management programs.

9. The sales meet the standards of 11 AAC 95.820 through sale design and post-harvest clean-up that will minimize the visual impact of the harvest operations and improve aesthetics in the long-term.

In addition, I find that this Final Decision satisfies the objectives as stated in this document and it is in the best interests of the State to proceed with this action. This action is conducted under the authority of AS 38.05.035(e) and AS 38.05.110-.120.

A person affected by this decision who provided timely written comment on this decision may appeal it, in accordance with 11 AAC 02. Any appeal must be received by November 20, 2006, and may be mailed or delivered to Michael Menge, Commissioner, Department of Natural Resources, 550 W. 7th Avenue, Suite 1400, Anchorage, Alaska 99501; or faxed to (907) 269-8918, or sent by electronic mail to dnr_appeals@dnr.state.ak.us. If no appeal is filed by this date, this decision goes into effect as a final order and decision on November 30, 2006. An eligible person must first appeal this decision in accordance with 11 AAC 02 before appealing this decision to Superior Court. A copy of 11 AAC 02 may be obtained from any regional information office of the Department of Natural Resources.

Date: November 1, 2006

/s/ Michael Curran
Michael Curran, Regional Forester
Division of Forestry
Department of Natural Resources

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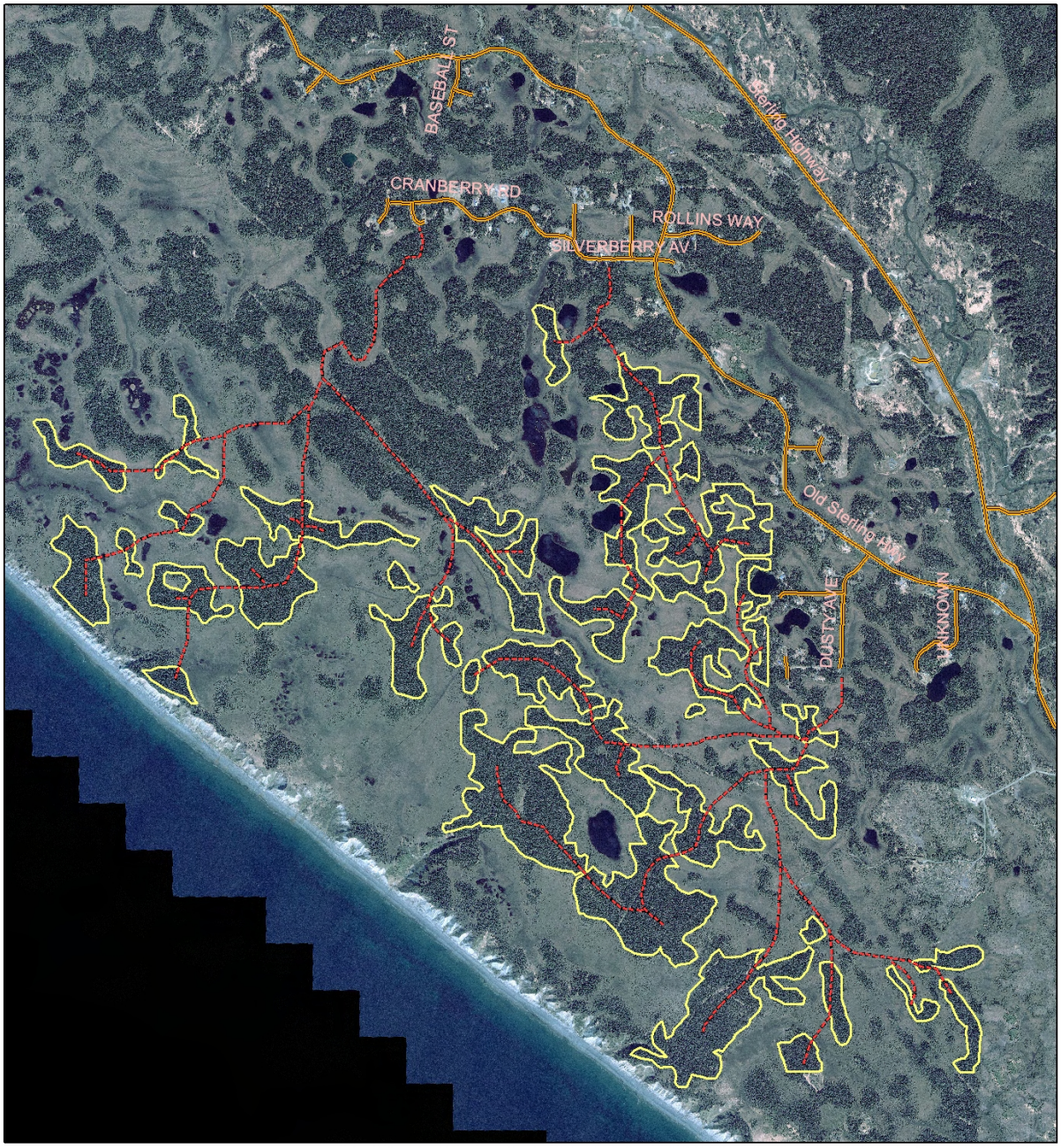
Pothole Timber Block



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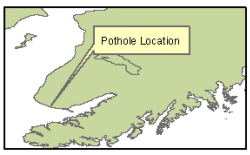

Legend

- Pothole Forest Mgt Areas
- Temporary Winter Road
- Public Road Locations

0 0.25 0.5 1 Miles